



# Soil Sample Preparation Standard Laboratory Module (SLM™)

## General Overview of the Soil Sample Preparation SLM

Soil samples represent a high percentage of the total samples that are scheduled for organic contaminant analysis within the Department of Energy's environmental remediation program. Typically, soil samples are manually delivered to an environmental laboratory in a variety of containers. Samples may contain both high moisture and large debris (such as sticks and rocks). This SLM is designed to homogenize, dry, and condition soil samples before introduction to Contaminant Analysis Automation (CAA) systems.

## Environmental Protection Agency (EPA) Method

The purpose of this module is to prepare the soil for sonication or Soxhlet extraction procedures as per EPA Methods 3540 and 3550.

## Standard Analysis Method (SAM)

This SLM may be used in SAM systems designed to analyze soil samples.

## Advantages

The technology integrated in this Soil Sample Preparation SLM will serve to automate the initial soil sample preparation tasks before these samples can be analyzed by a CAA system. By use of this SLM these tasks are accomplished automatically, decreasing sample variability, analyst safety hazards, and labor costs.

## General Description of the Soil Sample Preparation SLM

The conceptual design for the Soil Sample Preparation Module was developed assuming only moderate moisture content and debris less than five centimeters. The soil will be ground, passed through a 1-mm sieve, and mixed with a specified amount of sodium sulfate to produce a homogeneous mixture. With these basic assumptions, this module will perform the following top-level tasks: accept an input

beaker with the soil sample; place a specified mass of the prepared soil sample in an output beaker (if the sample is going to the sonication process) or in an output thimble (if the sample is going to the soxhlet extraction process), add a small amount of liquid spike and/or surrogate to the soil, and thoroughly clean all components to prevent cross-contamination of samples.

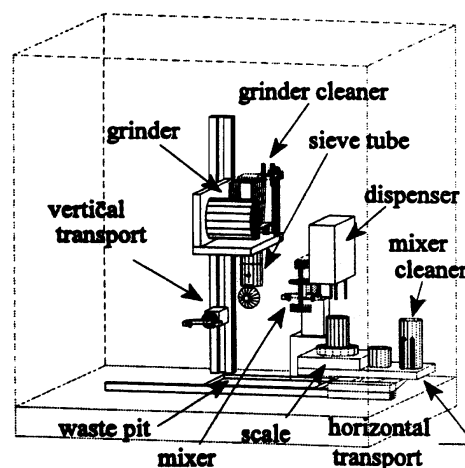


Figure 1. Final conceptual design of the Soil Sample Preparation SLM. The front of the unit is the left-hand side of the box.

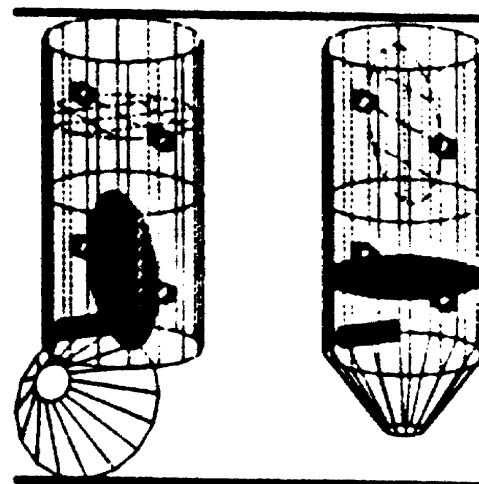


Figure 2. Sieve Tube.

The nine major components of the module are as follows:

1. The horizontal transport and scale with a sliding table that can be moved from the front to the back of the module.
2. A vertical transport unit to pick up a beaker containing soil, lift it, and pour it into the grinder.
3. A grinder used to reduce the particle size to less than 1mm.
4. A sieve tube with two different-sized sieves that can be rotated into position. The course sieve allows 0.5-inch sized particles to pass; the fine sieve allows 1-mm sized particles to pass. The motor on the grinder vibrates the sieve. The bottom of the sieve tube acts as a funnel and can be rotated out of the way.
5. A mixer unit, which stirs material in a beaker to create a homogeneous mix.
6. A dispenser to deliver sodium sulfate and any surrogates or spikes.
7. A grinder/sieve-tube cleaning mechanism to spray a high-pressure cleaning solvent through the grinder and sieve tube. The liquid waste will fall into the waste pit. Pressurized air will be used to dry the surfaces of the grinder and the sieve tube.
8. A waste pit area to catch debris and cleaning fluid. The fluid can be recycled and reused.
9. A mixer-cleaning mechanism to allow the mixing-bar apparatus to soak in a cleaning solvent.

### Status

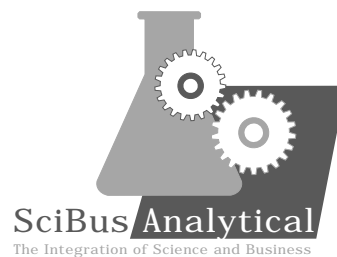
This SLM is in development.

### Industrial Partner

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University of Florida  
University of Tennessee  
University of Texas

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